

GROWERTALKS

Pest Management

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Another Tool in the Arsenal Against Aphids

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An increasing number of growers start their production cycle using biocontrol against major pests and stay with the biocontrol program as long as possible. Over time, they may have to switch to a chemical program or finish with a chemical clean-up. Several advantages of this approach exist: 1) Resistance management—using biocontrol as long as possible preserves the efficacy of pesticides for when they're really needed; and 2) promoting success of biocontrol against other pests—many pesticides have side effects on biocontrol agents.

Even if a pesticide is deemed compatible in one of the side effects databases, this doesn't mean it's completely safe to use with bios. A pesticide with a rating of 1 ("compatible") may still kill up to 25% of the tested biocontrol agent and can affect its efficacy by reducing searching ability, reproduction and overall fitness (called sub-lethal effects).

This article will discuss questions you should ask yourself when designing an aphid biocontrol strategy and will also describe different tools available to ensure successful aphid control.

Set yourself up for success

Sometimes, pests seem to appear magically and randomly, but with a rigorous and regular monitoring program and good record keeping of findings, you can probably see patterns emerge when analyzing several years of data together. For instance, certain pests may show up at a particular time and/or place every year or be related to specific events. Then your scouting efforts can turn into a predictive tool used to implement effective preventative strategies.

For example, we compiled scouting data from a local greenhouse and found that the appearance of potato and foxglove aphids was closely tied to the time of year and temperatures outside the greenhouse. By increasing the scouting efforts at this particular time, the grower increases the chances of detecting aphid infestations at an earlier stage. Biocontrol measures can then be put in place quickly and effectively. (Don't forget, some crops are easier to scout than others. Hanging baskets are hard to reach for a human, but not for aphids!)

Another question to explore is: How do aphids come into a crop? Can you keep them out by tightening up biosecurity in the greenhouse? Two obvious options are to screen vents and to clean up incoming plant material.

Finally, why do aphids like your crop so much? Do you grow susceptible varieties? It may be better to replace them with more resistant or tolerant varieties. If not possible (customers may love the same plants the aphids love as well), make scouting and treating these plants a priority.

A fertilizer strategy may also make plants more nutritious to aphids. Certain plants absorb excess nutrients and store them in their tissues. Therefore, optimizing fertilizer to avoid excess may help decrease aphid population growth.

Start with the release of parasitoids

The aphid parasitoid *Aphidius colemani* (effective against cotton/melon and green peach aphids) can be introduced in the greenhouse preventively using banker plants. These plants will maintain parasitoid populations in the absence of pest aphids and ensure biocontrol starts as soon as the first pest aphids show up. Unfortunately, there are no banker plants for other aphid parasitoids, such as *Aphidius ervi* (against potato and foxglove aphids) and *Aphidius matricariae* (against green peach aphids). These parasitoids can be released preventively, but it's important to realize that they'll die or leave after a few days due to the lack of aphid hosts.

Therefore, thorough and regular scouting to find aphids as soon as they appear is the key to success. Once you find the first aphids (and, yes, it's a matter of when, not if), don't wait. The aphid parasitoids are the first line of defense and should be released every week for several weeks. We like to use cardboard release boxes in order for the product not to fall off the plant onto the floor and dab a small droplet of honey on the box as a food source for emerging parasitoids (Figure 1).

Aphids parasitized by *Aphidius* species turn into papery-brown aphid mummies, which are easy to see and will give an indication whether the biocontrol program is working. Yet, some aphid species, like foxglove aphids, will drop off the plant when they feel threatened in an attempt to avoid parasitism. This disrupts their feeding and will actually contribute to aphid control (called non-consumptive effects). However, it makes aphid mummies difficult to find if the aphids drop after they're parasitized. So, in these cases, the reduced number of aphids should be used as a measure of biocontrol success.

Predators & biopesticides as supporting strategies

If the aphid number increases despite the release of parasitoids, other biocontrol agents, such as predators and/or biopesticides, can be used as supporting strategies. The gall midge *Aphidoletes aphidimyza* is quite effective against aphids found in the higher strata of plants, but don't seem to be able to find aphids on lower leaves, such as foxglove aphids (Figure 2). Generalist predators, including lacewings and lady beetles, are less effective at managing aphids in low numbers, but are voracious feeders excelling at cleaning up hot spots.

Several new aphid predators are currently under development at different research institutes, including a syrphid for aphid control at lower temperatures and a generalist predatory mite.

Biopesticides based on the entomopathogenic fungi *Beauveria bassiana* or *Metarhizium anisopliae* are good spray options. They need to contact the aphids to work, so good spray coverage is essential.

Use pesticides for cleanup, if necessary

It's possible that the strategies outlined above won't get you to the end of the production cycle; now is the time to consider one or more applications of pesticides to ensure a clean product at sale. In many cases, only a clean-up spray is required. However, if you reach this point earlier in the production cycle, make sure to choose a pesticide that's compatible with aphid biocontrol agents, especially if you want to reintroduce them after spraying. Also ensure that it won't disrupt other biocontrol programs that may be going on against other pests.

Conclusion

The integrated pest management (IPM) strategy we developed for control against foxglove aphids is summarized as

an infographic in Figure 3. Biocontrol of aphids can be difficult, depending on the aphid species you're dealing with. By taking a strategic approach, it's possible to determine what will work best for you. **GT**

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